

STEREO Mission Design

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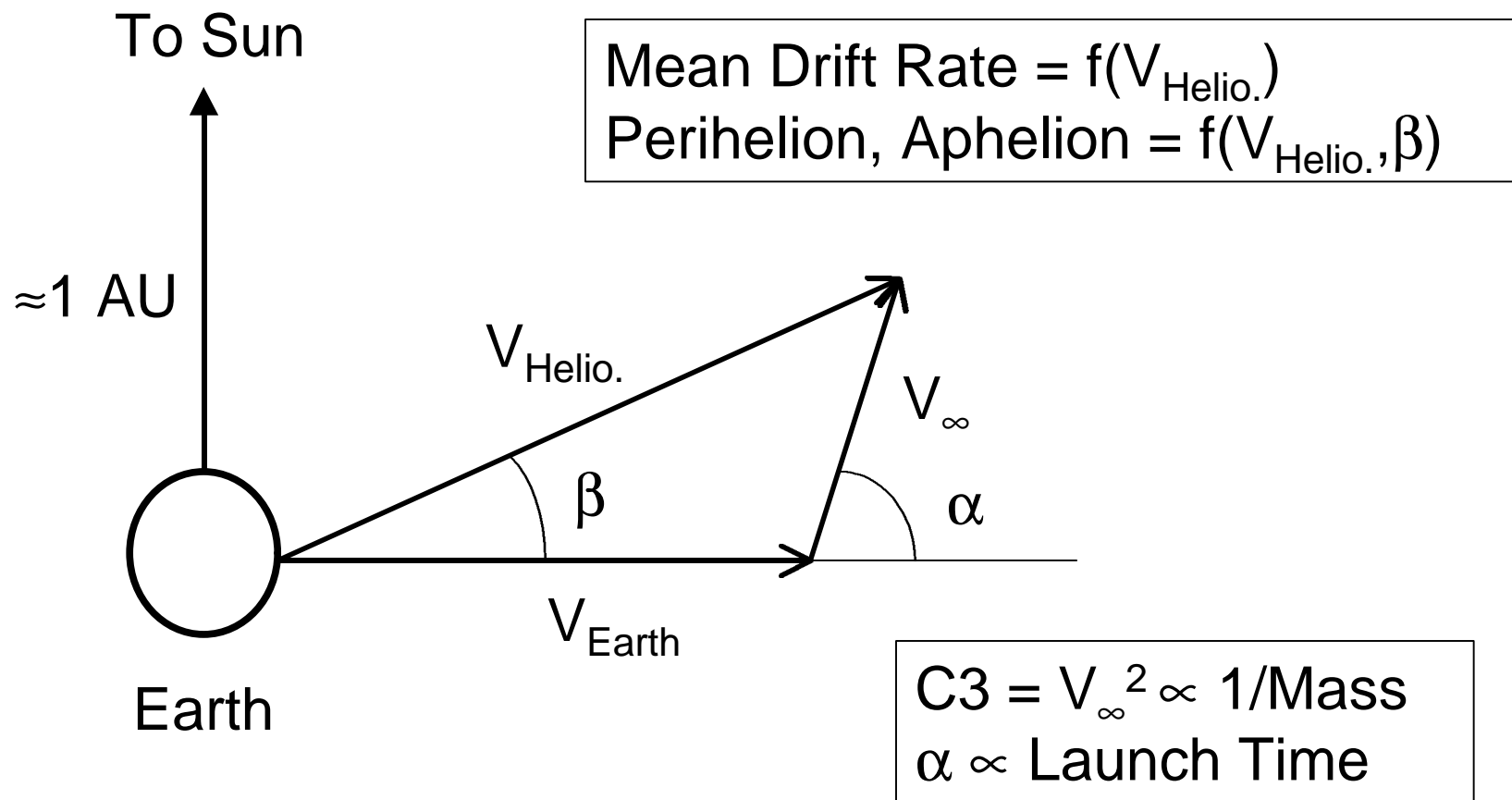
Orbit Requirements

- Orbit configuration is defined by the desired time history of the spacecraft angular separation
 - Absolute spacecraft separation
 - Relative separation from Earth-Sun line
- Solar drift orbits are defined by Mean Drift Rate relative to the Earth
- Symmetric or Asymmetric configurations are achievable
 - Lead S/C Drift Rate = TBD
 - Lag S/C Drift Rate = TBD
- Maximum Mean Drift Rate = 30 deg/yr

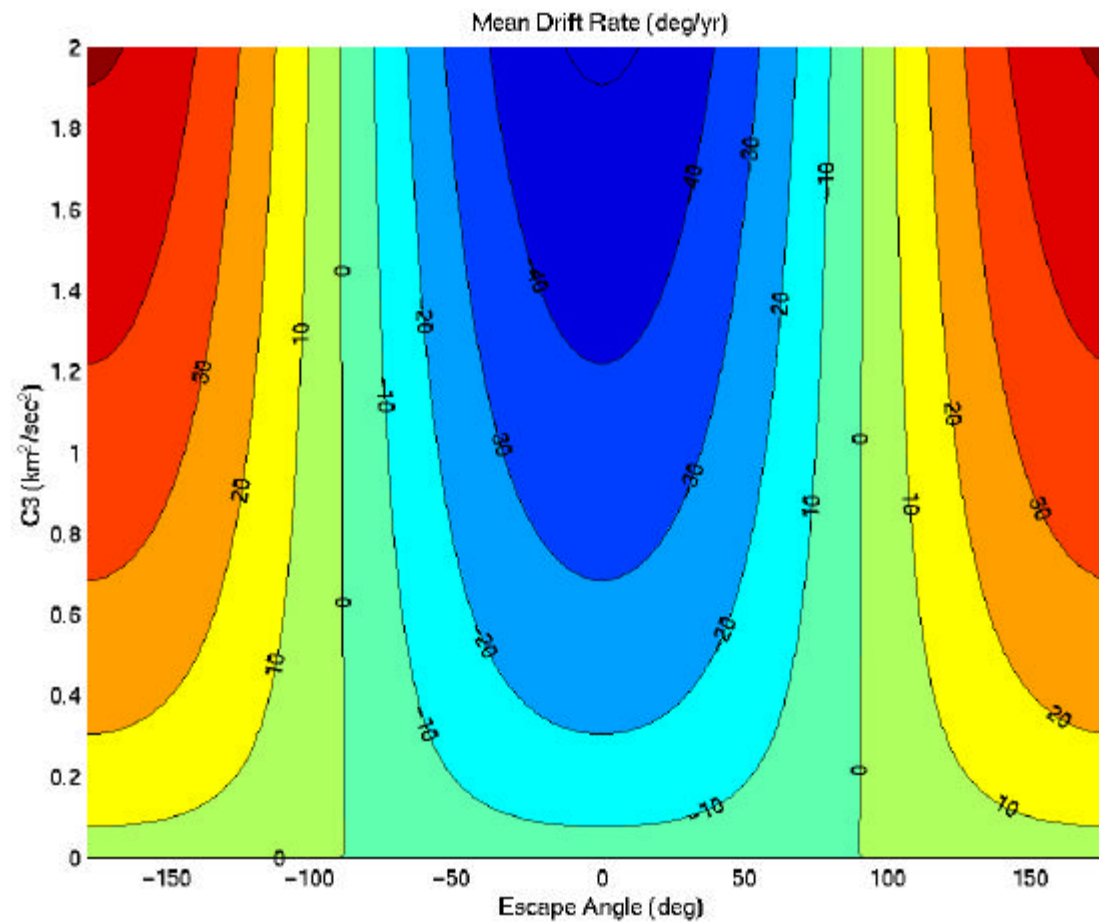
Orbit Drivers

- Desired Mean Drift Rate for each spacecraft
- Launch vehicle selection
 - Launch opportunity window (days we can launch)
 - Daily launch window (what time we can launch)
- Launch vehicle performance
 - Achievable drift rates and drift rate accuracy are determined by launch vehicle performance.
 - Some optimization of dwell time history may be achievable.
- S/C Propulsion
 - None
 - Perigee Kick Motor required for some launch modes
 - On-board propulsion required for some orbit transfer modes (e.g. lunar flyby, libration point phasing)

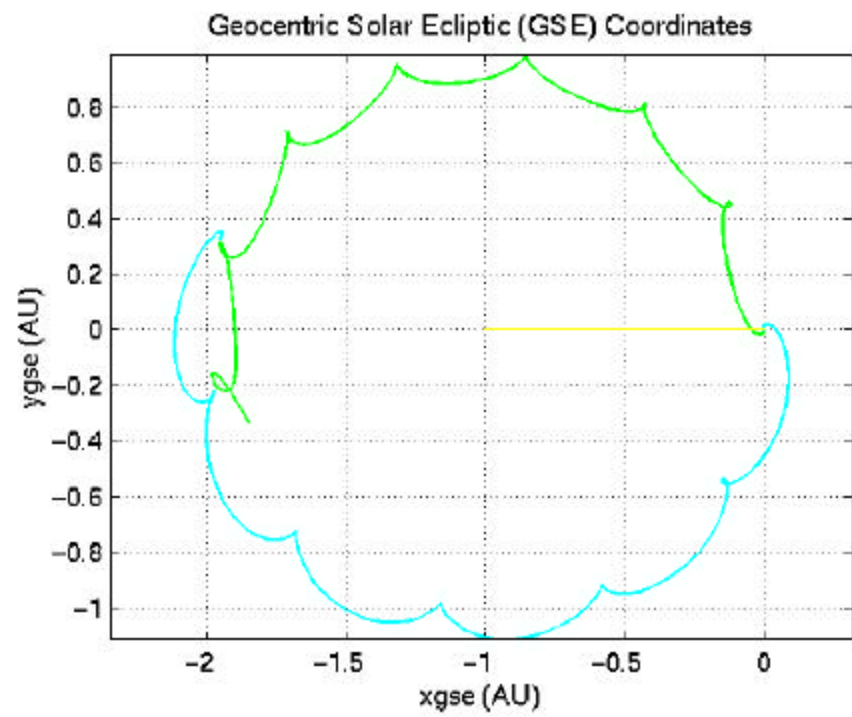
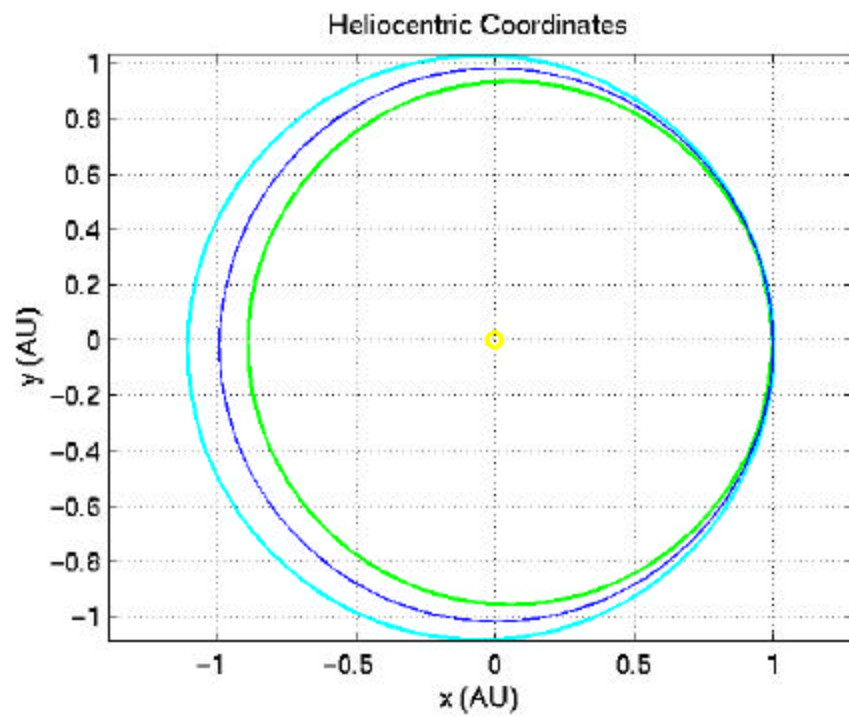
Mission Design



Orbit Selection



Orbit Diagram



Preliminary Launch Mode/Orbit Assessment

Launch Mode	Mission Parameter	Lunar Flyby	Libration Point Phasing	Direct
Shuttle	Propulsion	PKM + S/C	PKM + S/C	PKM
	Mass	High	High	High
	Operations	Complex	Complex	Somewhat Complex
1 ELV (e.g. Delta, ...)	Propulsion	S/C	S/C	PKM (1 or 2)
	Mass	High	Medium	Low
	Operations	Somewhat Complex	Somewhat Complex	Somewhat Complex
2 ELV (e.g. Taurus, Athena II, ...)	Propulsion	S/C	S/C	None
	Mass	High	Medium	Low
	Operations	Somewhat Complex	Somewhat Complex	Simple

Key:

PKM = Perigee Kick Motor

S/C = Spacecraft



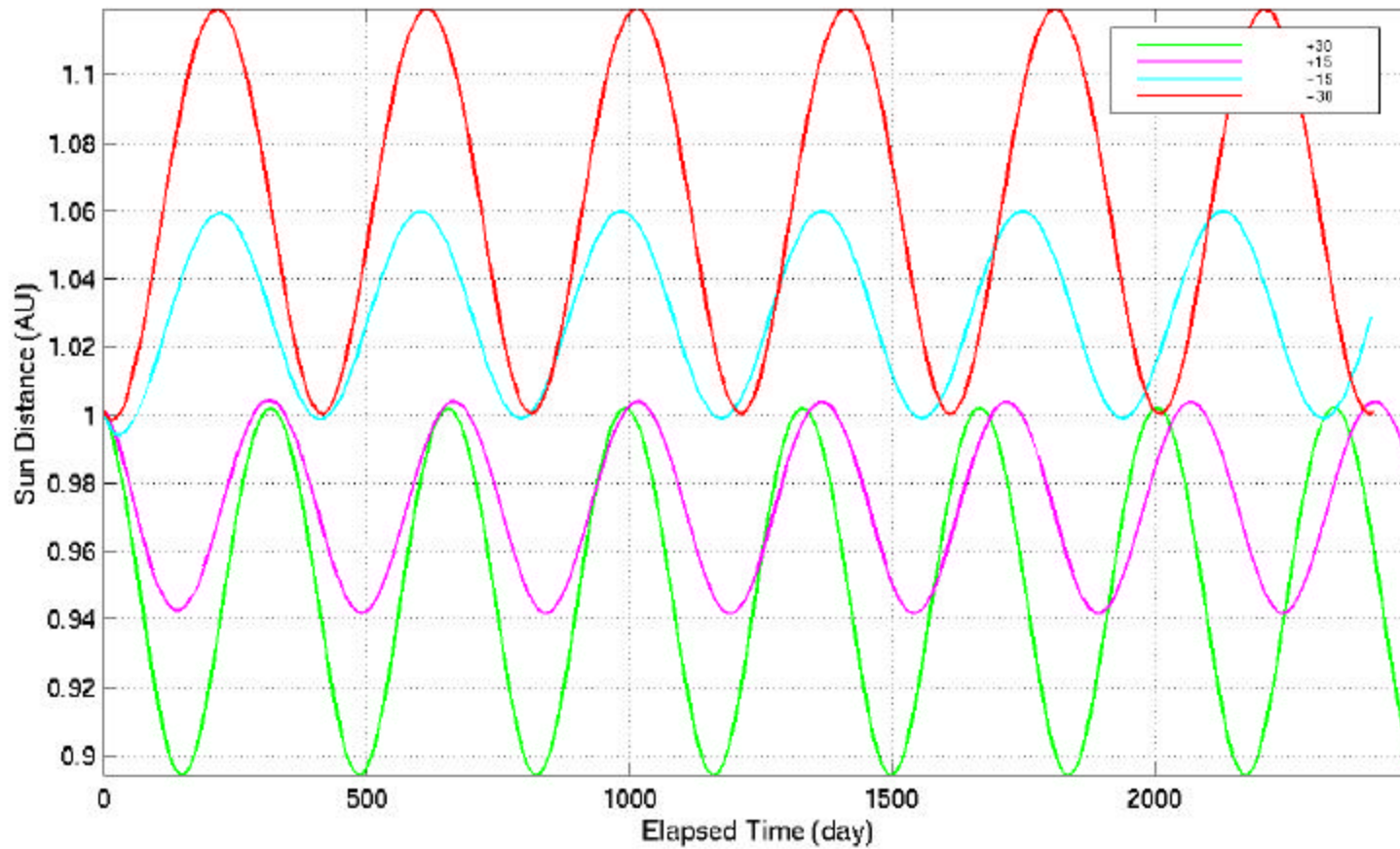
= *Rust Report* Design

Orbit Parameters

- Design Envelope
 - Launch Energy, $C3 = [0.0 \ 2.0] \text{ km}^2/\text{sec}^2$
 - Mean Drift Rate = $\pm 30 \text{ deg/yr}$
- Sun Distance
 - Perihelion (min) 0.86 AU (1 AU - 21 million km)
 - Aphelion (max) 1.16 AU (1 AU + 24 million km)
- Earth Subtended Angle $< 1 \text{ deg}$ @ Launch + 5 days
- Eclipse Duration (TBD)
- Station Visibility (TBD)

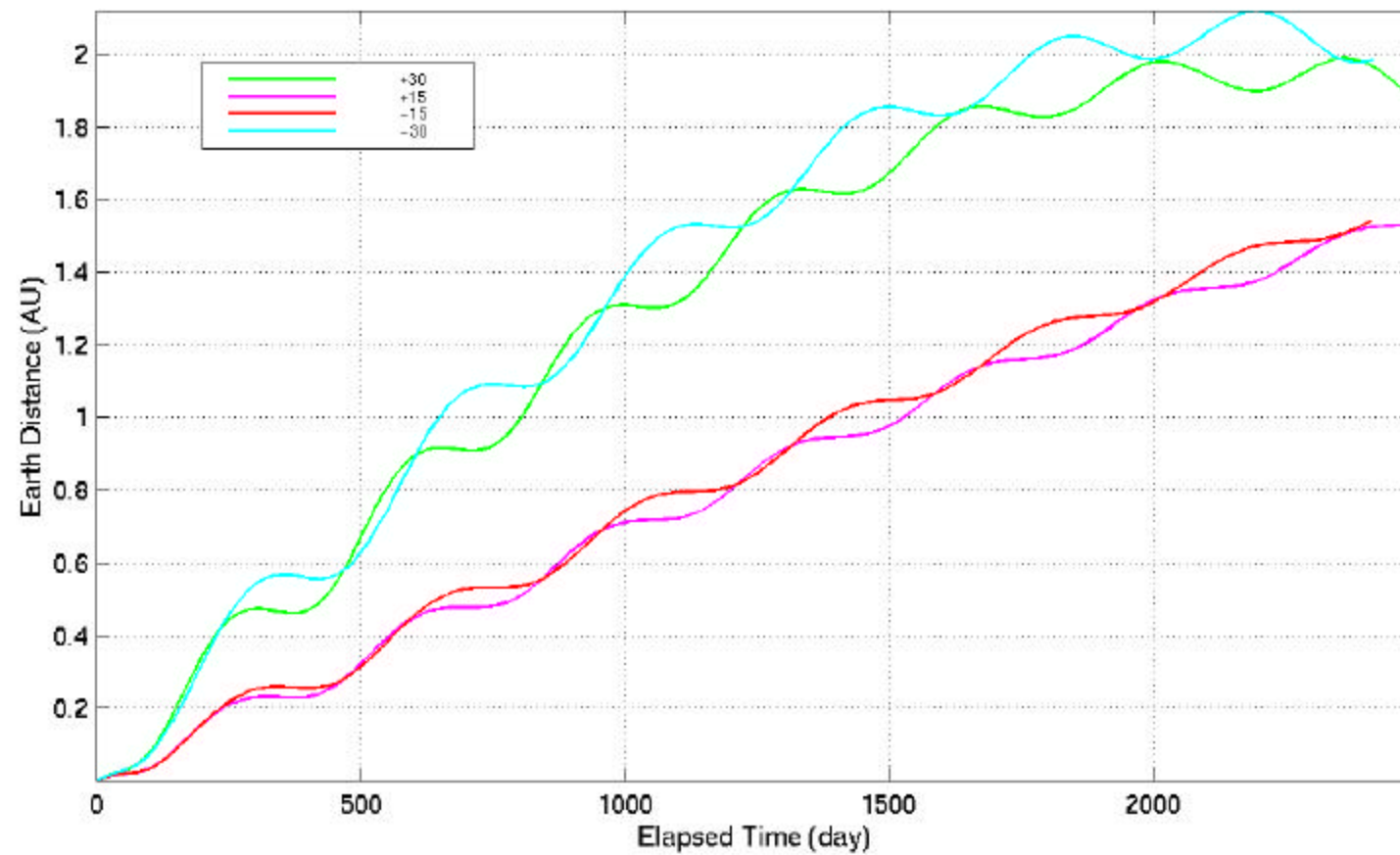
STEREO-Sun Distance

(minimum C3 solutions, $V_{\infty} \parallel V_{\text{Earth}}$)



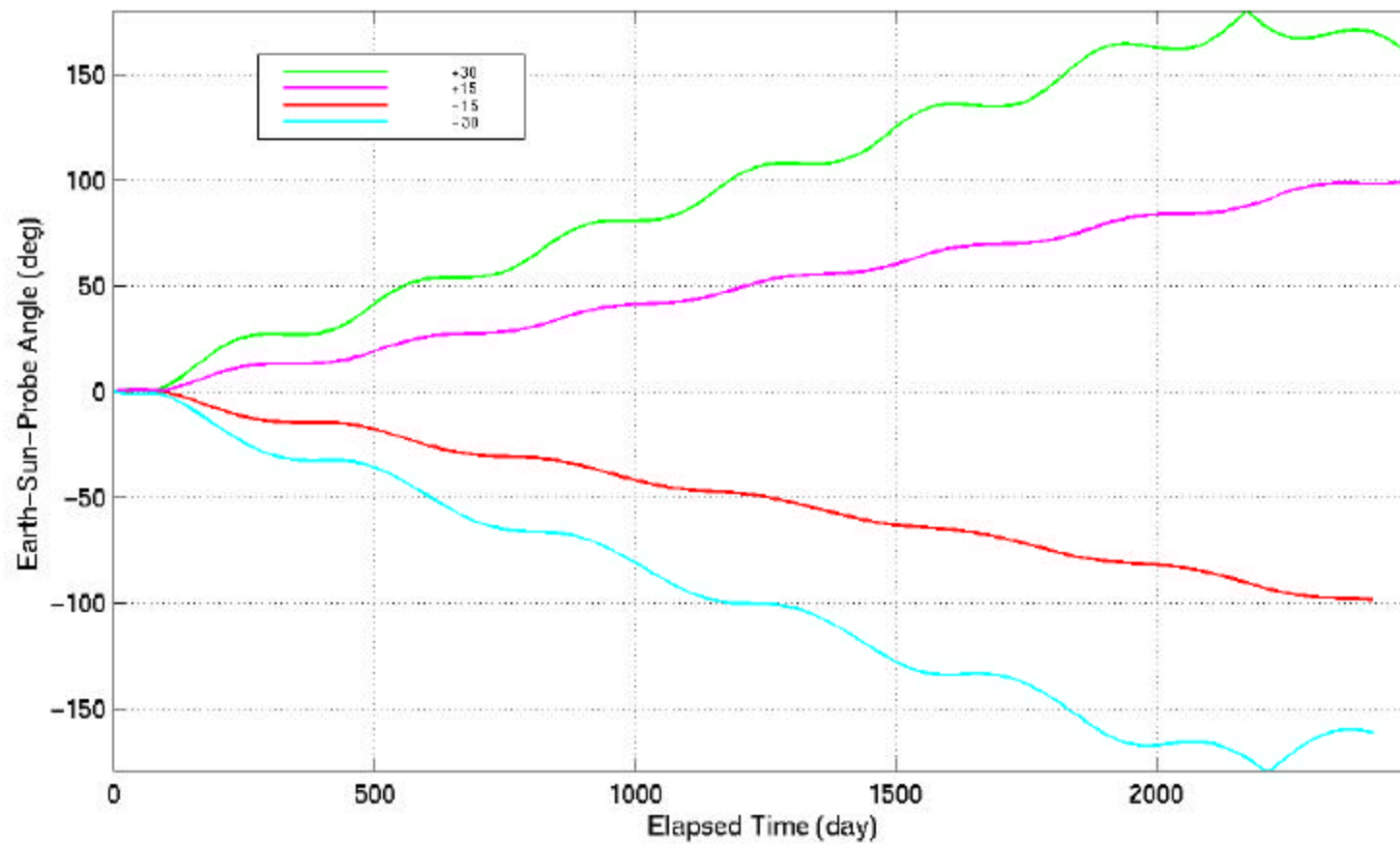
STEREO-Earth Distance

(minimum C3 solutions, $V_{\infty} \parallel V_{\text{Earth}}$)



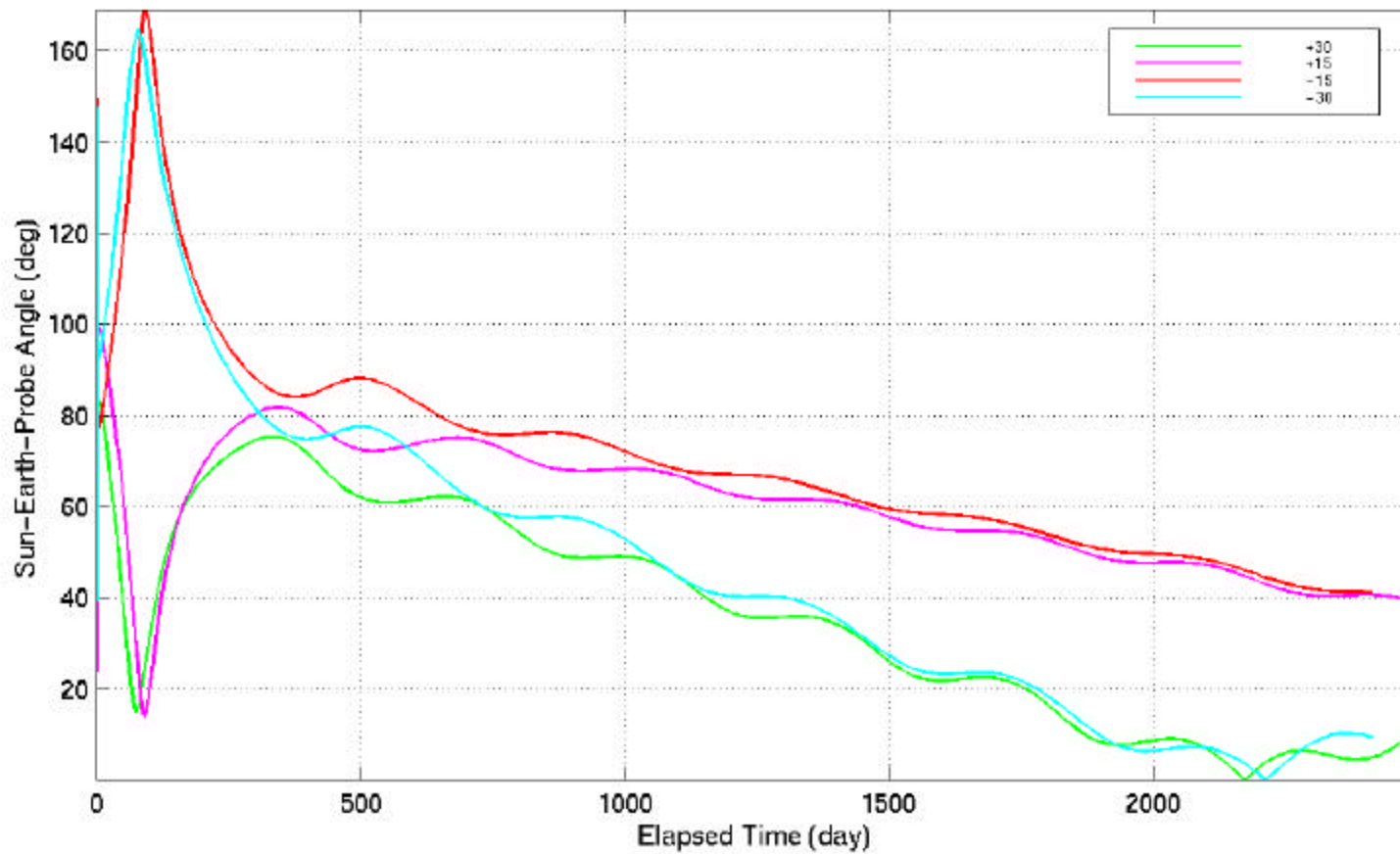
Earth-Sun-Probe Angle

(minimum C3 solutions, $V_{\infty} \parallel V_{\text{Earth}}$)



Sun-Earth-Probe Angle

(minimum C3 solutions, $V_{\infty} \parallel V_{\text{Earth}}$)



Sun-Probe-Earth Angle

(minimum C3 solutions, $V_{\infty} \parallel V_{\text{Earth}}$)

